1. A liftoff method for photolithography, comprising:

depositing a layer of photoresist on a substrate;

exposing and developing said photoresist layer thereby forming a photoresist pattern having sidewalls and an upper surface;

irradiating said upper surface with an ion beam having a direction parallel to said sidewalls, said ion beam comprising ions whose energy is too low to sputter said layer of photoresist;

maintaining said ion beam irradiation for a time period whereby a hardened layer is formed that extends a distance downwards from said upper surface, all remaining photoresist being unhardened;

then exposing said photoresist pattern to ozone whereby said sidewalls are eroded and said hardened layer is unchanged so that the hardened layer overhangs the unhardened layer;

depositing a layer of a material onto all horizontal surfaces to a thickness that is less than that of said unhardened photoresist layer; and

selectively removing said unhardened photoresist layer whereby all of said material that is deposited onto said hardened photoresist layer is lifted off.

2. The liftoff method recited in claim 1 wherein said layer of photoresist is a negative resist or a positive resist.

3. The liftoff method recited in claim 1 wherein said layer of photoresist is deposited to a thickness between about 0.1 and 0.4 microns.

4. The liftoff method recited in claim 1 wherein said ion beam has an energy between about 50 and 200 volts.

5. The liftoff method recited in claim 1 wherein said time period for which said ion beam irradiation is maintained is between about 2 and 20 minutes.

6. The liftoff method recited in claim 1 wherein said distance for which said hardened layer extends downwards is between about 100 and 500 Angstroms.

7. The liftoff method recited in claim 1 wherein the step of exposing said photoresist pattern to ozone further comprises placing the wafers in an ozone chamber, heating them to between 70 and 150 °C at an ozone concentration of between 10 to 200 gm/m^3 at an ozone flow rate of 1 to 100 L/minute for between 1 and 60 minutes.

8. The liftoff method recited in claim 1 wherein said hardened layer overhangs the unhardened layer by between about 0.01 and 0.1 microns on each side.

9. The liftoff method recited in claim 1 wherein the step of selectively removing said

unhardened photoresist layer further comprises using N-methyl-2-pyrrolidone at a temperature between 50 and 90 °C for 30 to 60 minutes.

10. A process to manufacture a CPP magnetic read head, comprising:

depositing a lower conducting lead on a substrate;

forming a CPP read stack on said lower conducting lead;

depositing a layer of photoresist on said CPP read stack;

exposing and developing said photoresist layer thereby forming a photoresist pattern, having sidewalls and an upper surface, that defines a top area for said CPP read stack;

irradiating said upper surface with an ion beam having a direction parallel to said sidewalls, said ion beam comprising ions whose energy is too low to sputter said layer of photoresist;

maintaining said ion beam irradiation for a time period whereby a hardened layer is formed that extends a distance downwards from said upper surface, all remaining photoresist being unhardened;

then exposing said photoresist pattern to ozone whereby said sidewalls are eroded and said hardened layer is unchanged so that the hardened layer overhangs the unhardened layer;

then, through ion milling, removing all of said CPP read stack, down to the level of said conducting lead, that does not lie directly beneath said hardened layer;

depositing a longitudinal bias layer and then a dielectric layer onto all horizontal surfaces to a combined thickness that is less than that of said unhardened photoresist layer;

selectively removing said unhardened photoresist layer whereby all of said bias and dielectric layers material that contact said hardened photoresist layer are lifted off; and

depositing an upper conductive lead onto all exposed surfaces.

11. The process described in claim 10 wherein said CPP read stack is a GMR stack.

12. The process described in claim 10 wherein said CPP read stack is a magnetic tunnel junction stack.

13. The process described in claim 10 wherein said CPP read stack has a thickness between about 200 and 450 Angstroms.

14. The process described in claim 10 wherein said layer of photoresist is a negative resist or a positive resist.

15. The process described in claim 10 wherein said layer of photoresist is deposited to a thickness between about 0.1 and 0.4 microns.

16. The process described in claim 10 wherein said ion beam has an energy between about 50 and 200 volts.

17. The process described in claim 10 wherein said time period for which said ion beam irradiation is maintained is between about 2 and 20 minutes.

18. The process described in claim 10 wherein said distance for which said hardened layer extends downwards is between about 100 and 500 Angstroms.

19. The process described in claim 10 wherein the step of exposing said photoresist pattern to ozone further comprises placing the wafers in an ozone chamber, heating them to between 70 and 150 °C at an ozone concentration of between 10 to 200 gm/m^3 at an ozone flow rate of 1 to 100 L/minute for between 1 and 60 minutes.

20. The process described in claim 10 wherein said hardened layer overhangs the unhardened layer by between about 0.01 and 0.1 microns on each side.

21. The process described in claim 10 wherein the step of selectively removing said unhardened photoresist layer further comprises using N-methyl-2-pyrrolidone at a temperature between 50 and 90 °C for 30 to 60 minutes.

22. A process to manufacture a CIP magnetic read head, comprising:

depositing a lower magnetic shield on a substrate;

forming a first dielectric gap layer on said lower magnetic shield;

forming a CIP GMR stack on said dielectric gap layer;

depositing a layer of photoresist on said GMR stack;

exposing and developing said photoresist layer thereby forming a photoresist pattern, having sidewalls and an upper surface, that defines a top area for said CIP GMR stack;

irradiating said upper surface with an ion beam having a direction parallel to said sidewalls, said ion beam comprising ions whose energy is too low to sputter said layer of photoresist;

maintaining said ion beam irradiation for a time period whereby a hardened layer is formed that extends a distance downwards from said upper surface, all remaining photoresist remaining unhardened;

then exposing said photoresist pattern to ozone whereby said sidewalls are eroded and said hardened layer is unchanged so that the hardened layer overhangs the unhardened layer;

then, through ion milling, removing all of said CIP GMR stack that does not lie directly beneath said hardened layer and adjusting said ion milling process so that said CIP GMR stack has sloping sidewalls;

depositing a longitudinal bias layer, to a thickness that equals that of said CIP GMR

stack, and then depositing a conducting lead layer to a thickness that, when combined with that of said longitudinal bias layer, is less than that of said unhardened photoresist layer;

selectively removing all unhardened photoresist whereby all bias and conducting lead layers that contact said hardened photoresist are lifted off;

depositing a second dielectric gap layer on all exposed surfaces; and

depositing an upper magnetic shield on said second dielectric gap layer.

23. The process described in claim 22 wherein said CPP read stack has a thickness between about 200 and 450 Angstroms.

24. The process described in claim 22 wherein said layer of photoresist is a negative resist or a positive resist.

25. The process described in claim 22 wherein said layer of photoresist is deposited to a thickness between about 0.1 and 0.4 microns.

26. The process described in claim 22 wherein said ion beam has an energy between about 50 and 200 volts.

27. The process described in claim 22 wherein said time period for which said ion beam irradiation is maintained is between about 5 and 20 minutes.

28. The process described in claim 22 wherein said distance for which said hardened layer extends downwards is between about 100 and 500 Angstroms.

29. The process described in claim 22 wherein the step of exposing said photoresist pattern to ozone further comprises placing the wafers in an ozone chamber, heating them to between 70 and 150 °C at an ozone concentration of between 10 to 200 gm/m^3 at an ozone flow rate of 1 to 100 L/minute for between 1 and 60 minutes.

30. The process described in claim 22 wherein said hardened layer overhangs the unhardened layer by between about 0.01 and 0.1 microns on each side.

31. The process described in claim 22 wherein the step of selectively removing said unhardened photoresist layer further comprises using N-methyl-2-pyrrolidone at a temperature between 50 and 90 °C for 30 to 60 minutes.

32. A photoresist pattern suitable for liftoff, comprising;

a single photoresist layer;

said single photoresist layer further consisting of an upper portion that is resistant to chemical attack and a lower portion that is susceptible to chemical attack; and

said upper portion overhanging said lower portion.

33. The photoresist pattern described in claim 32 wherein said single layer of photoresist has a thickness between about 0.1 and 0.4 microns

34. The photoresist pattern described in claim 32 wherein said upper portion of photoresist has a thickness between about 100 and 500 Angstroms.

35. The photoresist pattern described in claim 32 wherein the upper portion overhangs the lower portion by between about 0.01 and 0.1 microns on each side.